REMARKS

Applicant cancels claims 1 and 10-12; therefore, claims 2-6, 9 and 13-26 are all the claims pending in the application.

The Examiner rejects claims 1-6 and 8-26 under 35 U.S.C. § 103(a) as being unpatentable over EP 0947325 (Chang '325) in view of EP 0988974 (Chang '974). The Examiner also objects to claim 22 due to a minor informality.

As noted above, Applicant cancels claims 1 and 10-12; therefore, the Examiner's rejection of these claims is moot. Applicant corrects the minor informality (noted by the Examiner) in claim 22, and amends claim 2, 3, 5, 6, 9, 13 and 16 to depend on claim 22.

Applicant respectfully traverses the Examiner's prior art rejections of claims 2-6, 9 and 13-26 as follows.

One of the features of Applicant's claimed invention is a second contracting element, which drives the pressure generating element so as to contract the pressure chamber expanded by the second expanding element, such that (1) a contracted amount of the pressure chamber established by the second contracting element is larger than at least one of a contracted amount of the pressure chamber established by the first contracting element and an expanded amount of the pressure chamber established by the second expanding element, and (2) the contracted amount of the pressure chamber established by the second contracting element is not larger than an expanded amount of the pressure chamber established by the first expanding element (see Applicant's independent claims 17 and 22).

The Examiner cites Chang '325 alleging that the relationship Vh > Vc2 (as shown in Fig. 9) of Chang, and relationship Vc2 > Vc1 (as shown in Fig. 13 of Chang) combine to supply the above-noted requirement of Applicant's claims 17 and 22. Applicant respectfully disagrees.

In fact, Applicant's claims 17 and 22 require a drive signal in which the relationship Vh > Vc2 > Vc1 is satisfied at the same time, that is, used for the same condition. The drive signals shown in Chang '325 Figs. 9 and 13 are independently and respectively selected and used for different conditions. In picking and choosing separate pieces of a single reference, the Examiner has failed to consider the reference for what it fairly teaches "as whole" (as required by MPEP). That is, nowhere does Change disclose, teach or suggest a drive signal which satisfies both the Vh > Vc2 and Vc2 > Vc1 relationships at the same time.

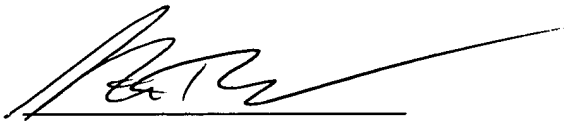
Furthermore, a second contracting element as defined in Applicant's claims 17 and 22 relates to liquid drop ejection. To the contrary, the waveform element h in Chang '325 Fig. 9 and the waveform element h3 in Chang '325 Fig. 13 (cited by the Examiner as allegedly corresponding to the claimed second contracting element), do not relate to liquid drop ejection. Instead, these pertain to damping elements for suppressing the meniscus vibration so as not to eject a liquid droplet.

Chang '974 does not supply the above-noted deficiencies of Chang '325. Therefore, Applicant's independent claims 17 and 22, as well as the dependent claims 2-6, 9, 13, 16, 18-21 and 23-26 (which incorporate all the novel and unobvious features of their respective base claims) would not have been obvious from any reasonable combination of Chang '325 and Chang '974.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned attorney at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 1 and 10-12 are canceled.

The claims are amended as follows:

2. (Amended) The liquid jetting apparatus as set forth in claim [1] 22, wherein a potential difference of the first expanding element is equal to the potential difference of the drive signal.

3. (Amended) The liquid jetting apparatus as set forth in claim [1] 22, wherein the potential difference of the first contracting element is not greater than 50% of the potential the drive signal; and

wherein a potential difference of the second expanding element is not less than 40% of the potential difference of the drive signal.

5. (Amended) The liquid jetting apparatus as set forth in claim [1] 22, wherein the second expanding element is supplied for a time period which is not greater than one quarter the natural vibration period of the pressure chamber.

6. (Amended) The liquid jetting apparatus as set forth in claim [1] 22, wherein a gradient of the second expanding element is greater than a gradient of the first contracting element.

9. (Amended) The liquid jetting apparatus as set forth in claim [8] 22, wherein a potential difference of the second contracting element is not less than 75% of the potential difference of the drive signal.

13. (Amended) The liquid jetting apparatus as set forth in claim [8] 22, wherein the drive pulse includes: a damping hold element, which holds a termination end potential of the second contracting element for a predetermined time period; and

a damping element, supplied after the damping holding element to drive the pressure generating element so as to expand the pressure chamber to a reference volume thereof.

16. (Amended) The liquid jetting apparatus as set forth in claim [1] 22, wherein the drive pulse includes a preliminary contracting element, which drives the pressure generating element so as to contract the pressure chamber from a reference volume thereof, before the first expanding element is supplied.

22. (Amended) A liquid jetting apparatus, comprising:

a liquid jetting head, including a nozzle orifice, a pressure chamber communicated with the nozzle orifice, and a pressure generating element which varies, the volume of the pressure chamber; and

a drive signal generator, which generates a drive signal including a drive pulse, supplied to the pressure generating element, the drive pulse including:

a first expanding element, which drives the pressure generating element so as to expand the pressure chamber, so that a meniscus of liquid in the nozzle orifice is pulled toward the pressure chamber as much as possible;

a first contracting element, which drives the pressure generating element so as to contract the pressure chamber expanded by the first expanding element, so that a center portion of the meniscus is swelled in an ejecting direction of a liquid drop;

a second expanding element, which drives the pressure generating element so as to expand the pressure chamber contracted by the first contracting element, so that a marginal portion of the swelled center portion of the meniscus is pulled toward the pressure chamber; and

a second contracting element, which drives the pressure generating element so as to contract the pressure chamber expanded by the second expanding element, so that the meniscus is again urged in the ejecting direction to increase jetting speed of a satellite liquid drop which follows a main liquid drops,

wherein a contracted amount of the pressure chamber established by the second contracting element is larger than at least one of a contracted amount [....] of the pressure chamber established by the first contracting element and an expanded amount of the pressure chamber established by the second expanding element; and

wherein the contracted amount of the pressure chamber established by the second contracting element is not larger than an expanded amount of the pressure chamber established by the first expanding element.